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WHAT IS CLAIMED IS:

1. A silicon-based film comprising a crystal
phase formed on a substrate with a surface shape
represented by a function f , wherein the silicon-based
5 film is formed on a substrate with a surface shape
having a standard deviation of an inclination \arctan
(df/dx) from 15° to 55° within the range of a sampling
length dx from 20 nm to 100 nm, a Raman scattering
strength resulting from an amorphous component in the
10 silicon-based film is not more than a Raman scattering
strength resulting from a crystalline component, and a
difference between a spacing in a direction parallel to
a principal surface of the substrate and a spacing of
single crystal silicon is within the range of 0.2% to
15 1.0% with regard to the spacing of the single crystal
silicon.

2. The silicon-based film according to claim 1,
comprising a crystal of a columnar structure in a
20 thickness direction.

3. The silicon-based film according to claim 1,
wherein a percentage of a diffraction strength of (220)
plane due to X-ray or electron beam diffraction is 30%
25 or more of a total diffraction strength.

4. The silicon-based film according to claim 1, which is formed by a plasma CVD method using a high frequency.

5 5. The silicon-based film according to claim 4, wherein the high frequency is not less than 10 MHz but no more than 10 GHz.

6. A photovoltaic element comprising a
10 silicon-based semiconductor layer having at least one pin junction on a support, wherein at least one i-type semiconductor layer comprises the silicon-based film as set forth in any one of claims 1 to 5.

15 7. The photovoltaic element according to claim 6, wherein the silicon-based semiconductor layer is formed on a substrate comprising at least a first transparent conductive layer stacked on the support, and the first transparent conductive layer has the surface shape
20 represented by the function f .

8. The photovoltaic element according to claim 6, wherein the support is a conductive support.

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